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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/517,314	03/02/00	CHO	C M4065.0223/P

MM91/0214
Thomas J D Amico
Dickstein Shapiro Morin & Oshinsky LLP
2101 L Street NW
Washington DC 20037-1526

EXAMINER	
KANG, D	
ART UNIT	**PAPER NUMBER**
2811	

DATE MAILED: 02/14/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/517,314	Applicant(s) CHO, CHIH-CHEN	
	Examiner Donghee Kang	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If the period for reply specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *33-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-32) in Paper No. 6 is acknowledged.

Drawings

2. Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims **17 & 26** are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recitation of "further comprising an array of said memory cells" can be interpreted as setting forth structure not supported by the specification. There is no support in the specification for an array of said memory cells as recited in claim 17. The recitation of "semiconductor die being electrically connected to said conductive connector" can be interpreted as setting forth structure not supported by the specification. There is no support in the specification for "semiconductor die being electrically connected to said conductive connector as recited in claim 26.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims **11 & 25** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claims 11 & 25 recites the limitation "a conductive plug positioned within an insulator layer" in lines 15 & 6. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims **1, 3-8, 18, 20-21, & 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al (US 6,008,117).

Regarding claim **1**, Hong et al discloses a semiconductor structure comprising (Fig.1H):

an insulator layer (12); a conductive plug (16) positioned within said insulator layer; a diffusion barrier layer (14) located on said insulator layer and surrounding said plug; a non-conductive layer (22) having an etched via at least partially over conductive

plug; and a conductive connector (38) formed in said via in electrical contact with said plug. See also Col.2, lines 41-61.

Hong et al does not expressly teach the diffusion barrier layer (14) used as an etch-stop layer. It is inherent that the diffusion barrier layer (14) taught by Hong et al prevents the etching of insulator layer (12) since the material of diffusion barrier layer (silicon nitride) is identical with claimed etch-stop layer.

It is conventional in the art to provide the etch-stop and would have been obvious to one of ordinary skill in the art at the time the invention was made to form etch-stop layers in order to prevent the etching of insulator layer.

Regarding claim **3**, Hong et al discloses the etch-stop layer comprising a silicon nitride. See Col.2 line 54.

Regarding claims **4-6**, Hong et al does not teach the etch-stop layer comprises silicon carbide, silicon dioxide, and BLOK (mixture of silicon nitride and silicon carbide).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the etch stop layer, *having the materials as claimed*, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Regarding claims **7-8 & 20-21**, Hong et al discloses the non-conductive layer comprising a borophosphosilicated glass. See Col.2, line50.

Regarding claim **18**, Hong et al discloses a semiconductor device comprising (Fig.1H):

a conductive element (16); an etch-resistant layer (14) surrounding an upper portion of said conductive element; a non-conductive layer (22) over said etch resistant layer and having a via over said conductive element, said via extending down to a level of said conductive element and etch resistant layer; and a conductive material (38) located in said via, wherein said conductive material contacts said conductive element.

Hong et al does not expressly teach the diffusion barrier layer (14) used as an etch-stop layer. It is inherent that the diffusion barrier layer (14) taught by Hong et al prevents the etching of insulator layer (12) since the material of diffusion barrier layer (silicon nitride) is identical with claimed etch-stop layer.

It is conventional in the art to provide the etch-stop and would have been obvious to one of ordinary skill in the art at the time the invention was made to form etch-stop layers in order to prevent the etching of insulator layer.

Regarding claim **23**, Hong et al discloses a semiconductor device further comprising a conductive layer (34) located in said via.

10. Claims **2, 9-16, 19, 22, & 24-32,** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al in view of Admitted prior art (Fig. 1).

Regarding claims **10-11, 19, & 24**, Hong et al discloses a semiconductor device comprising (Fig.1H):

a conductive plug (16) positioned within an insulator; an etch-stop layer (14) deposited on said insulator and around said conductive plug; an intermediate non-conductive layer (22) provided over said etch stop layer and having an etched via over

said plug; and at least one conductive layer (38) in said via in electrical connection with said plug.

Hong et al does not teach an active region in a substrate. However, admitted prior art teaches in Fig.1 the active region (22), wherein the conductive plug is provided on active region.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide active region (doped region) in substrate since the active region (doped region) provide an electrical connects with interconnect layer in semiconductor device.

Regarding claims **2, 12, & 15**, Admitted prior art teaches conductive layer comprise (Fig. 1):

a first conductive layer (12) formed in said etched via, said first conductive layer including a portion in contact with said conductive plug; and a second conductive layer (16) deposited over and in contact with said first conductive layer.

Regarding claims **13-14 & 28-29**, Hong et al discloses the non-conductive layer comprising a borophosphosilicated glass. See Col.2, line50.

Regarding claims **9,15-16, 22, & 30-31**, Admitted prior art teaches the first conductive layer and second conductive layer comprising one or more materials, such as aluminum, copper, and doped polysilicon. See page 2, lines 15-16.

Regarding claims **25**, Hong et al discloses a semiconductor device comprising (Fig.1H):

a conductive plug (16) positioned within an insulator; an etch-stop layer (14) deposited on said insulator and around said conductive plug; an intermediate non-conductive layer (22) provided over said etch stop layer and having an etched via over said plug; and at least one conductive layer (38) in said via in electrical connection with said plug.

Hong et al does not teach a connection region in a substrate. However, admitted prior art teaches in Fig.1 the connection region (22), wherein the conductive plug provide on active region and a first conductive layer (12) deposited in and in contact with etched via.

Regarding claims **27 & 32**, Admitted prior art teaches the connection region comprises a doped region (22) within substrate, wherein conductive plug (M_1) is located over connection region.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Donghee Kang** whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DHK
February 6, 2001

Tom Thomas

TOM THOMAS
SUPERVISORY PATENT EXAMINER